

Wargames, Training, and Decision-Making.
Increasing the Experience of Army Leaders

A Monograph
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ABSTRACT

WARGAMES, TRAINING, AND DECISION-MAKING. INCREASING THE EXPERIENCE OF ARMY LEADERS by MAJ Bruce E. Stanley, USA, 44 pages.

The purpose of this monograph is to examine the capabilities of commercial computer wargames and determine if the Army can use them to train its leaders. The study is intended for all Army leaders, from team leader through joint task force commander, interested in training tools to supplement the existing training methods in the Army.

There are several problems inhibiting the training of the Army's leadership. The first problem is finite resources such as personnel, training dollars, land, and ammunition. Second is a high operational deployment tempo that reduces the available training time. Third is an increased rotation of leaders within units lowering the level of experience of leaders. Finally, restrictions on training with certain weapon systems and ammunition at their operational ranges causes soldiers to ignore the realities of combat. The results are less experienced leaders incapable of dealing with the complexities particular to the Army. This monograph examines the question: can commercial computer wargames increase the experience level and decision making abilities of Army leaders? Additionally, the monograph looks at three secondary questions. How can the Army use computer wargames to increase experience and decision making? Why should the Army use computer wargames? Finally, what are the benefits of computer wargames for the Army?

This monograph shows the computer wargame used consistently by army leaders can increase experience and decision making skills. Like any training, computer wargames must be used repetitively to achieve results. Commercial computer wargames are available now. The software industry produces a wide variety of wargames enabling leaders to focus on the level of war that suits rank and position. The costs of computer wargames are negligible. The army could purchase site license from the software industry for wide distribution or units could locally purchase the games. The bottom line is, using commercial computer wargames to develop the decision-making abilities of army leaders and increase their experience just makes sense.

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CHAPTER 1 INTRODUCTION

War is chaotic, full of unknowns, and governed by chance. It can be mastered only through practice and the best practice is combat experience.¹ Throughout history soldiers studied war through the writings of other soldiers, military theorists, and observers of warfare. After study, the soldiers took what they learned, and applied it to training and combat. Through this they determined lessons they learned were valid and could meet their current and future needs. A difficulty they encountered was how the lessons could be tested when budgets, environmental damage, politics, and a variety of other resource constraints, limit the ways lessons could be applied and concepts examined. Recently, the solution to this difficulty has been through simulation. By definition, anything not actually combat is simulation. Simulation allows the soldier to exercise doctrine and tactics through one of its three types: live, virtual, or constructive. When combined the three types of simulation form a training process, where each training step leads into the next until full combat readiness is achieved.²

The purpose of this monograph is to examine the capabilities of commercial computer wargames and determine if the U.S. Army can use them to train its leaders. The study is intended for all Army leaders, from team leader through joint task force commander, interested in training tools to supplement the existing training methods in the Army. The monograph intends to determine which computer wargames can be useful in developing the decision-making

abilities of leaders and adding to their experience level with an available, low cost, and easy to use tool.

There are several problems inhibiting the training of the Army's leadership. The first problem is finite resources such as personnel, training dollars, land, and ammunition. Second is a high operational deployment tempo that reduces the available training time. Third is an increased rotation of leaders within units lowering the level of experience of leaders. Finally, restrictions on training with certain weapon systems and ammunition at their operational ranges causes soldiers to ignore the realities of combat. The results are less experienced leaders incapable of dealing with the complexities particular to the Army. Reduced experience and higher complexity leaves Army leaders at all levels not only unable to make complex decisions, but frequently unaware of the difficulties facing them on the modern battlefield. One way to overcome this problem of training and education in peacetime is through the use of computer wargames.³

The environment in which the Army operates has changed in the last ten years. The growth of information technology improves battle command functionality and requires a change in the decision cycle of a commander. Continual downsizing broadens the responsibility of all leaders and increases decision-making at all levels. The list of possible missions has increased, reducing the knowledge of a given situation. These range from peacetime training, the spectrum of peace operations, small-scale contingencies, and a major theater of war. These changes require the Army not to follow standard procedures. There is a continual need for improvisation and adjustment by the

commander to fit the changing environment. The military leader must have increased initiative, greater adaptability, less reliance on detailed training programs to meet known requirements, and increased reliance on decision skills.⁴

The penalty for ineffectiveness in the military could cost a soldier his life or the annihilation of his unit. No other profession known to man exacts such a severe price and has such far-reaching consequences for lack of success. Few other professions require such risk of death and injury even when one performs effectively. This requires the development of skills, which the soldier may never be called upon to use. The skills must be learned vicariously. Most other professions require participation in the profession as it is conducted in the real world. This practice of the profession involves continued use of its skills in real-life situations; not so in the art of war. The supreme and ultimate practice of the military art can be exercised only in actual warfare.⁵

Most of the time a soldier learns military skills in peacetime. The study of warfare substitutes for personal participation. Military schools teach principles, doctrine, and techniques using historical examples and practical application. The military is concerned with the best possible training. Means are needed to place soldiers and leaders in situations similar to those faced in real war and practice is needed to increase the skills that ensure effective tactical response to real war situation.⁶

This monograph examines the question: can commercial computer wargames increase the experience level and decision-making abilities of Army

leaders? Additionally, the monograph looks at three secondary questions. How can the Army use computer wargames to increase experience and decision-making? Why should the Army use computer wargames? Finally, what are the benefits of computer wargames for the Army?

There is a requirement that army's train and develop leaders to meet the challenges they may face on the battlefield. No army is capable of training its leaders for all the tasks or the problems they may face in battle. They can develop leaders with the cognitive abilities to solve the problems they do face. Additionally, an army is not able to develop experienced leaders without participating in constant war, which is unrealistic. The problems the Army faces in peacetime is a constrained budget that limits training due to competing demands for finite resources.

Personal computers have exploded into the consumer market place. The availability, reduced cost, and ease of use has placed them in most businesses, homes, and in the military. Computers and their accompanying software on the market today provide a variety of uses that include education, financial, business, and entertainment.

Military wargames and decision-making games are available on the commercial computer software market. The Army can use several of these commercial games to train its leaders. These games range from tactics at the squad through division, to operational art at the corps and theater, to the strategic and diplomatic level of nation-states. The games can supplement the leader-training program most units incorporate into their overall training

methodology. The team leader and company commander can benefit just as much from using these games as the division staff officer or the joint task force commander.

This study is limited to commercial wargames and does not address the wargames currently used by the military such as JANUS or WARSIM.⁷ The focus of the monograph is on computer wargames played by one or more individuals and does not require extensive support from organizations such as contractors or other military units. The monograph reviews some of the existing games and those due out in the near future. Computer hardware and software is not examined though the monograph acknowledges each will continue to improve dramatically in the future enabling even greater utility by the Army for computer wargames.

The references used for this monograph fall into three subject categories: military wargames, commercial games, and decision-making. The history and recommended use of military wargames are addressed in a variety of books and articles written by members or former members of the military. These provide the definitions and historical foundations for wargaming. Sources for commercial gaming range from books and gaming magazines to Internet web sites and interviews with game producers. These references address the current and future games available, game design, and provide editorials describing the advantages and limitations of wargaming. The discussion of decision-making is addressed in books from the academic community and from organizations such as the Army Research Institute and the Army Battle Command Battle Lab.

Decision-making is addressed in terms of how decisions are made, how to improve decision-making, and decision-making in the Army.

The monograph examines the requirement to train leaders, develop their experience level, and improve decision-making in a complex environment. The monograph begins with a review of the definition of wargames, their history, some facts about wargames, and a review of skill development and decision-making. The monograph then looks at decision-making, why the Army should use computer wargames, and the types of games available. The benefits of computer wargames are examined as well as the limitations and pitfalls. Computer wargames are evaluated based on a set of criteria to determine if their use can help the Army train leaders. Finally the monograph concludes with recommendations about what types of computer games to use; what the design of the wargame should achieve; how to implement the training program; and what the benefits the Army can gain from implementing this program.

The monograph uses three criteria to evaluate computer wargame use by the military. These are cost effectiveness, time saving, and high payoff training. The goal of the Army is its ability to provide leaders with a multitude of experiences to improve their leadership and decision-making abilities. Cost effective training is necessary so other forms of training used by the Army are not significantly reduced to resource this form of training. Competition for a finite amount of resources could prejudice the implementation of this training if it is perceived to inhibit the current training strategy. Time saved is important if wargames can reduce the operational tempo of deployments, reduce the time

required for leader training, and increase learning in a shorter timeframe. Instead of waiting to go to the training, the training comes to the leader. The definition of high payoff training means achieving more than one learning objective or the accomplishment of more tasks with fewer resources. This ties the other evaluation criteria together when cost is reduced, time is saved, experience increased, and leaders learn more.

The next chapter defines wargames and simulations, explains the history of wargames, and provides a few examples of commercial computer wargames. This establishes a frame of reference for the monograph by providing a basic understanding of terminology and existing computer wargames. This sets the stage for the examination of the problem in the third chapter.

CHAPTER 2 WHAT IS A WARGAME?

The Department of Defense (DOD) Dictionary of Military and Associated Terms defines a war game as "a simulation, by whatever means, of a military operation involving two or more opposing forces, using rules, data, and procedures designed to depict an actual or assumed real life situation."⁸ Dr. David M. White in his dissertation on *Use and Selection of Games for Instruction*, defines simulations as representations of reality that can be manipulated and observed. He states games are activities carried out by cooperating or competing decision makers seeking to achieve objectives within a set of rules. He further asserts in combination, simulation games provide a medium for increasing options in teaching. Learning is achieved through active participation.⁹ Thomas Hones defines wargames in a Joint Forces Quarterly article a maneuver, a field exercise, a command post exercise, a map maneuver, a map exercise, or a certain kind of simulation.¹⁰

Wargames are usually simpler than models and simulations because a wargame is something of a competitive game that is played while a model is a more detailed representation of a specific military event. A model duplicates a function in great detail and exactitude. A simulation is a model or collection of models, which can be more easily manipulated to test "what if" questions. A simulation is a model that can move in many different directions. A wargame is a playable simulation. A conflict simulation is another name for wargame.¹¹

There are three types of simulations: live, virtual, and constructive. Live simulation is when units conduct field exercises ranging from squad tactics through brigade task force field exercises at the Army's Combat Training Centers. Virtual simulation is the use of computers to substitute live simulation. Some examples include flight simulators, weapon trainers, and unit/crew combat vehicle trainers. These take the place of live simulation but are costly and their limited numbers do not maximize the training opportunity. Constructive simulation is simply a computer wargame.¹²

Other types of simulations include the distributed interactive simulation (DIS) environment which is a synthetic scenario in which humans interact through a systematic connection of sub-component simulators, simulations and instrumented live task forces. Components of DIS reside at multiple, local and distant locations, using different simulation equipment, tied together through standard communications designs.¹³ Virtual simulations, manned simulations, computer-generated forces and computer wargames create an integrated virtual battlefield environment. The synthetic theater of war architecture (STOW-A) is structured to provide seamless linkage in the constructed, virtual and live environments. The Army is currently taking this approach to its training. This approach allows participants to interact in a larger dynamic battlefield.¹⁴

Simulated warfare enables soldiers to gain experience, identify errors or shortcomings, and improve skills without paying the penalty imposed in the real world. Any profession in the real world as costly as war impels an organization to search for a substitute at least for the preparation if not the execution. Simulated

warfare provides a systematic method of studying military problems. A wargame duplicates the conditions and capabilities of combat units and can focus on situations involving hypothetical forces, weapons systems, and equipment not yet developed. The location of the military operations may be any portion of the earth's surface for which adequate maps exist, or the wargames may be played on hypothetical terrain to simulate any set of conditions. The terrain selected is not limited to areas controlled by the nations sponsoring the game. This is the case for field tests and maneuvers that employ real military forces.¹⁵

History of Wargames

Wargames have a very long history, especially for rulers and their military leaders. The oldest game is chess. It developed from the Indian game "Chaturanga" played by four people according to fixed rules using pieces that represented elephants, infantry, and cavalry.¹⁶

In 1664 Christopher Weikmann of Ulm Germany developed the wargame "Kings Game." It had thirty pieces per side and fourteen distinct moves.¹⁷ In 1784, Helwig master of pages to the Duke of Brunswick developed a more complex game consisting of pieces representing military units (infantry, cavalry, and artillery) instead of individuals. The playing board had squares overlaid on colored terrain.¹⁸

The Prussian, Georg Vinturinus, developed "Neue Kriegspiel" later in the 18th century. Its game board represented terrain between France and Belgium. The player used over 1,800 pieces to represent units of various arms. The

rulebook was over 60 pages and included specifics such as reinforcements and logistics.¹⁹ Von Reisswitz, a Prussian, made improvements to the game in 1811. He replaced the game board with a terrain model and added blocks to represent units. His son further refined the game by replacing the terrain model with a large-scale map and a revision of the rules to resemble more closely combat of the times. Additionally he color coded each side with blue and red and added an umpire to settle disputes and determine casualties and enforce the rulebook.²⁰ By 1877 the game was revised by von Verdy to eliminate the rulebook and umpires and have the game governed by tactical rules. This was outlined in his book "War Game."²¹ "Why, this is not a game, it is a veritable war school! It is my duty to recommend it to the Army." General von Muffling, Chief of the German General Staff, 1824 said after witnessing an exhibition of the first Wargame, KRIEGSPIEL designed by Lieutenant George Heinrich Rudolph Johann von Reisswitz.²²

Germany continued to use wargames through WW I and II. Britain, Japan, and the US all used wargames from the late 1800s through WW II to develop plans and train leaders. The United States Navy used wargames that enabled officers to practice giving and interpreting orders and to test new doctrine that was the foundation of fleet actions.²³ The US Army moved away from wargames at the end of World War II for several reasons. This was primarily due to an increase in operational research techniques used during the war. Operational research was unable to model successfully the chaos of the battlefield. Rigorous simulations were doomed to failure due to the complex

nature of warfare. Dispassionate analysis became the method of evaluation versus a realistic approach to capabilities. In addition, wargames were identified with the defeated German Army and lost favor among senior officers. Future war planning moved away from historical study as a method to formulate future plans and policy. Instead wargaming in the US Army was reduced to a logistics and support function. Finally, the US was ignorant of the fact the Russians still used wargames.²⁴

By 1980, people realized that the precise and unambiguous approach to wargaming could not be realized, chaos theory emerged and gave the high precision crowd a scientific reason for admitting that the older wargaming techniques did indeed work.²⁵ It became apparent absolute accuracy in wargames was difficult to attain, and often unnecessary. The reliability and accuracy of the older-style wargames was good enough to use and the popularity of wargames increased.

The first board wargames produced in the US were from Avalon Hill, founded by Charles S. Roberts II in 1952. He developed wargames while in the National Guard to help improve military skills. Jim Dunnigan followed him in the early 1970s who continued to produce over 100 wargames during the next 10 years.²⁶ Commercial computer wargames were developed in the early 1980s. The first game was called "Tanktics" and simulated a tactical tank battle with the human pitted against the computer.²⁷ On 2 August 1990 the first wargame played by the Pentagon in response to the Iraq invasion of Kuwait was *Gulf Strike*, a commercial wargame.²⁸

The United States Marine Corps began using commercial simulations, which emerged from an initiative begun by General Charles C. Krulak, the USMC Commandant. General Krulak directed Marine units to conduct tactical decision meetings and daily war fighting discussions. From this small units began training on the computer wargame *DOOM*. *DOOM* is used to train fire teams on urban combat tactics and techniques. The advantage to using the simulation is the USMC ability to free valuable range time. The marine base at Quantico has only one combat town. Fire teams work out their bugs using the *DOOM* simulation so they can operate at close to full speed in the field. Until recently, Marine Doom was just a proof of concept program that cost a total of \$200 all for the off the shelf software. Additionally, the game can be customized to incorporated digitized embassy floor plans as well as a variety of other terrain and weapon systems.²⁹

The Wargame

What is a wargame? A wargame is an attempt to get a jump on the future by obtaining a better understanding of the past. A wargame is a combination of "game", history, and science. It is glorified chess. A wargame usually combines a map, playing pieces representing historical personages or military units, and a set of rules telling you what you can or cannot do with them. The object of any wargame is to enable the player to re-create a specific event and more important to be able to explore what might have been if the player decides to do things differently.³⁰

A simulation is by its nature a potentially very complex device.³¹

Simulation games include many nonhistorical subjects; therefore experience of any sort is one of the most important things a simulation game has to offer. This experience consists of the gamers being able to massage information in order to see what different shapes the information is capable of taking.³² Whether historical or nonhistorical, almost all simulation games contain four general kinds of information: geographical, order of battle, situational, and dynamic potential.³³ Wargames are intellectually an adult exercise. The enthusiasm for wargames is similar to an enthusiasm for books; it tends to stay with you.³⁴

Statistically wargamers fall into some of the following categories; 13% are high school students, 9% are high school graduates, 13% attended college, 16% hold a four-year degree, and 37% are graduate students or have a graduate degree. The remaining 12% are a variety of people interested in games representing no particular group. In addition, gamers read a lot; they belong to a military book clubs, and are comfortable with complex games. A 1990 survey found that over 60% of the games were played solitaire. Gamers played a large number of shorter sessions based on solitaire play due to the limited amount of time available because of professional obligations. These gamers average 16 hours of play per month.³⁵

Unique mental skills are required to deal with all that goes on in a wargame and make the game work. Even computer wargames are considered a cut above average in complexity compared to most other games. Most wargamers like to call their games historical simulations.³⁶

What are the types of wargames?

Wargames fall into the categories of tactical, operational, or strategic.

Each of these wargames can be based on historical events, the present environment, or futuristic scenarios. Two examples of tactical wargames are the *Close Combat* series produced by Microsoft and the *Steel Panther* series produced by Strategic Simulations Inc.³⁷ The *Close Combat* series is historically based on the World War II campaigns of Normandy, Operation Market Garden, the Battle of the Bulge, and the Eastern Front. The *Steel Panther* series covers the historical battlefields of World War II, Korea, Vietnam, the Arab-Israeli Wars, Desert Storm, and future conflicts. *Steel Panthers* also enables the player to customize scenarios by changing terrain, units, and organizations. The player employs forces from the squad through brigade in these tactical games. *Steel Panthers* is a turn-based game and *Close Combat* is an interactive game. Turn based games allow the player to make decisions and move units with pauses between turns. The player acts and reacts continuously in *Close Combat* until the mission is complete.

The Operational Art of War (TOAOW) is an operational level wargame produced by Talon Soft Inc. Like the *Steel Panther* series, TOAOW covers the historical battlefields of World War II, Korea, Vietnam, and the Arab-Israeli Wars, Desert Storm, in addition to future conflicts. TOAOW enables the player to customize scenarios to vary terrain and organizations. TOAOW is a turn-based game like the *Steel Panther* series.

Microsoft also produces the *Age of Empire* I, II, and soon III. These are strategic interactive games requiring the player to make decisions concerning economic, diplomatic, and military matters. The game covers the historical periods from cave man through the 13th Century. The player is able to customize this game to fit a variety of scenarios.

The common theme these games are the decisions required of the player, the complexity of the scenarios, some form of competition either with the computer or another player, and the requirement to develop skills to succeed in the game. Feedback from the game for the most part is instantaneous. The artificial intelligence or database is very detailed for these games providing a wide variety of scenarios. The games graphics and video are realistic and provide the player with feeling of being a part of the scenario. The games cover each level of war required for the professional military officer to develop skills in current positions or for future positions.

Chapter three reviews how decisions are made and how problems are solved. Then the chapter reviews a few ways the military is developing these traits. The chapter concludes by offering computer wargames as a way to develop decision-making and increase experience.

CHAPTER 3 WHY COMPUTER WARGAMES?

Computer wargames enable military leaders the chance to develop skills, make decisions in time-constrained environments, and experience competition in a sterile form. Making decisions requires a set of skills developed over time, through experience and education. Military leaders are able to make consistently correct decisions because of experience gained through repetition and education. This cognition allows leaders to make correct decisions quickly in complex environments with confidence.

A decision is the action of deciding, settlement, determination, a conclusion, judgement, the making up of one's mind, or a resolution. Decision, as a quality is determination, firmness, and decidedness of character. The word decision comes from the Latin word that means "to cut off."³⁸ The word implies a preliminary confusion or hesitation. Where there is no choice involved we do not have the experience of making decisions or we experience it only in a mild form. If there are two equally inviting offers then you are in a decision-making situation.³⁹

The human mind does not naturally follow the neat, logical and sequential analysis usually recommended in a textbook. Far from decisions being based purely on rational reasons, John Adair found in his book *Training for Decisions*, strong admixtures of emotions, power politics, the influences of other people and the individual decisions maker's own values. Instead of following classic steps in which ends and means are distinguished Adair found that fact, values, ends and

means were confused. Owing to the limitations of the human mind, shortage of time, defective or inadequate communications systems and the confusion of facts and values, many decisions rested upon very incomplete information and the course selected was only one of a limited and incomplete number available. Adair concludes real decision-makers tended to reach decisions by muddling through with a concern for deciding promptly and with the least uncertainty. In almost all cases other people were consulted or involved, and the resulting decision was a compromise that would be acceptable to as wide a spectrum of the people concerned as possible.⁴⁰

What is problem solving? Most solutions result from a dialogue between previous experience and the present situation, or resonance. Success happens by chance as individuals restructure, actually or mentally, the presented data, based on what he sees in the present and what he remembers from experience. The problem solver can exhibit both a trial and error approach or an analytical examination of the end or goal and the means, before the resonance effects provide the solution. Valuable clues and signals in problem solving arrive from analysis based on experience. The more specific and definite they are the more they cut down the search for a solution. Models, signals, clues or hints cut down the time spent in blind seeking or groping.⁴¹

Problem solving time is cut when experience is involved. The problem solver can experience the exact same problem, a family of problems, or a theory in his mind that is defined as abstract distillation of past experience. The more specific the clues the quicker the problem is solved. The problem solver must

balance this with the optimum between the past and the present. Problem solvers must also balance loyalty to past knowledge and experience against the open and freethinking capacity of being surprised by the uniqueness and never-before quality of the present.⁴²

Thinking in deliberate or a purposeful sense of the word takes three basic forms all related to the evolutionary advance of man. These are analyzing, synthesizing, and evaluating.⁴³ Analyzing is the resolution into simple parts or loosening. Humans have a tremendous ability to analyze and do so because they can. Synthesizing is the putting together of parts or elements so as to make up a complex whole. Valuing is thinking in relation to values or standards.⁴⁴

Holistic and heuristic are methods of thinking. Holistic comes from the Greek *holas* meaning whole. This describes the tendency in nature to produce whole from the ordered grouping of units. When applied to the mind it suggests an intellectual and emotional bias towards seeing life in terms of wholes rather than parts.⁴⁵ Heuristic is defined as serving to find out. Specifically it is applied to a student who is trained to find out things for himself. Heuristic thinking is based on rules of thumb, laws, strategies, policies, maxims and proverbs. In general heuristic thinking is a way of going about things as opposed to specific clues or answers.⁴⁶

Dr. Gary Klein a well-known author on decision making and in partnership with the Army Research Institute conducted a study on Army decision-making. He identifies two types of decision-making; naturalistic decision-making (NDM)

and recognition prime decision-making (RPD). Klein indicates NDM is the way Army leaders make decisions in time-constrained or stressful situations.

Klein describes several ways military leaders make decisions. Experienced decisions makers can size up situations and recognize how to respond. They usually do not spend time comparing options. Emphasis is placed on situational awareness. They generate options and prior to solving the problem. Decisions are made in a natural setting or a challenging simulation, not in a laboratory. NDM focuses on how people handle time pressure, shifting conditions, unclear goals, degraded information, subtle clues and patterns, team interactions, and organizational constraints. The NDM research tries to understand how cognitive processes such as memory and attention affect decisions.⁴⁷

Recognition-Primed Decision Model (RPD) describes how people use experience to make decisions without comparing any options. Klein found commanders reported they were not making comparisons during decision-making. Commander's used experience to size up a situation and recognize the typical reaction to take. They are able to generate reasonable option as the first one considered. They did not search for the optimal solution, but arrived quickly at a workable solution. Commanders also identified a typical course of action evaluate it mentally simulating it to see if it would work in the context of the situation they were facing. If the course of action was satisfactory, they initiated the plan without delay. If they found flaws they would switch to a problem-solving mode to repair flaws. If they could not repair the flaws, they rejected the course

of action and considered the next most typical reaction. This continued until they found a workable option.⁴⁸

RPD hypothesizes the first option considered is usually workable. Comparing options is not a goal. Finding a workable course of action is a goal. Evaluating an option occurs by imagining how it will be carried out. Imagining the option being carried out, looking for weaknesses, and avoiding them strengthens options. The focus is on the way they assess the situation and judge it as familiar and not on choosing between options. The emphasis is on acting quickly and not on waiting until all the evaluations have been completed. RPD asserts people can use experience to generate a reasonable course of action as the first one considered.⁴⁹

Klein indicates the importance is on how decision-makers make decisions within their own domains. He emphasizes this is not necessarily generic decision-making. He states what matters are not just how people think, their strategies, but also what they think about, the content. Klein concludes training how to make decision should orient around where the barriers and difficulties in training exist.⁵⁰

Klein offers decision skills can be improved by focusing the decision-maker on skills that can be trained. These are situation awareness, pattern matching, and cue learning; typical cases and anomalies; mental models; time horizons; pre-mortem strategy and crystal ball strategy; and managing uncertainty and time pressure.⁵¹ Commercial computer wargames are capable

of training these skills in the context of the military operational setting required by Army leaders.

Klein provides several methods for training individuals to make better decisions. The design of training scenarios should include the skills that desire improvement. The After-Action Review (AAR) enhances cognitive feedback through cognitive modeling and expert/novice contrasts and the listing of common decision failures. Finally, training device specifications can focus the types of decision skills that require improvement.⁵² The first and last examples relate to computer wargames and how decision-making skill development can be designed into the games.

The United States Army and the United States Marine Corps use a type of game to train military personnel. These are called tactical decision games (TDG).⁵³ TDGs are used to teach leaders "how to think" and to practice decision-making. The military is now using the TDG as an integral part of part of the teaching process along with field problems, sand table exercise, and terrain walks. These decision games maximize training time both in the field and in garrison. It is an excellent opportunity-training tool or a deliberate training method for professional development. The USMC requires student officers to complete one TDG per day for 11 weeks. This provides the experience of 50 to 100 battles fought in a very short amount of time.

A TDG is a tactical problem consisting of a short written scenario, a sketch, a requirement with a dilemma, and a time limit. The written scenario tells the players who they are, what they have for assets, defines their mission, an

presents some type of enemy situation. The situation is usually vague and incomplete forcing players to make assumptions. The scenario is usually no more than a few paragraphs. The sketch allows the players to depict their graphics and present their plan to the group. The requirement is usually a written order to subordinate unit leaders. The time limit is normally less than ten minutes and is vital to the game since it provides the friction and pressure necessary to simulate combat.⁵⁴ Various conditions can be added to increase stress and realism. The TDG can be given after physical training, in a field environment, after a road march, or after a written test. The idea is to emphasize the need to be ready to make decisions anytime.

There are several reason to augment training with TDGs.⁵⁵ Practice makes perfect. TDGs are efficient and effective. They develop imagination, creativity; they encourage initiative and actions; and they make leaders familiar with making tough decisions. TDGs improve implicit communications skills therefore making better communicators. The TDG makes the leader think tactically which makes better tacticians. The TDG is an excellent means to mentor and teach subordinate leaders, which allows the leaders and subordinates to practice warfighting two levels up. In the words of one Marine Corps officer, tactical decision games make sense.⁵⁶

A way to improve on the TDG is to replace manual tactical decision games with commercial computer wargames. The same advantages of TDGs transfer to computer wargames. To make better decision-makers takes practice. Just as TDGs offer this practice computer wargames offer a supplement to leader

training whether it is in a school environment or part of a unit's professional development plan.

Why should the Army use computer games?

One of the most important attributes of any game is the ability to provide the experience to make rapid decisions. A game should provide the player with a multitude of decisions to make. The best games have many decision points and the player can effectively evaluate options when they come up. Tactical and operational wargames limit these to the maximum number of the units under one's command. With the current capabilities of personal computers these choices can be extremely rich. A good game enables the person who makes the best decisions win the game. On the other hand, when the players do not have the information they need to make informed decisions, or when so many variables are involved that proper evaluation is impossible for a human player in a reasonable amount of time a game is then considered a toy.

Games should present information or situations to the player that enables them to make intelligent decisions. This approach requires a basic comfort level regarding abstraction on the part of the game designers. At some point the designer must reduce information to a relatively simple set of numbers, no matter how complex the process that produced them.

Some designers believe the important thing is the software contains as much data as it can hold. The problem with this attitude from a game standpoint is that the player becomes less of a player and more of a spectator. The player

only watches things happen to his unit rather than using the information to their best competitive advantage by making good decisions.

Gary Geryk, an author who writes articles for *Games Domain*, indicates the problem with making combat models using complex equations is that the player is not going to solve these equations every time a decision is made.⁵⁷ The player may be aware of how the decision is going to be resolved, but in most cases the player is not going to try to evaluate this in order to play a game.

Some games provide for more of a "role-playing" experience out of their computer wargames. This is different from competitive games since they provide a player the feeling of being "immersed" in the time period being simulated. These are not competitive decision-making games; they are toys.

A competitive game requires some or a lot of control by the player which requires him to make decisions. This is a test of his skill against that of an opponent. Taking control away from the player decreases his opportunity to make informed decisions, which is what skill development is all about.⁵⁸

Why games?

There are four learning objectives that simulation games are capable of accomplishing for the military through the use of history. First, they have the capacity to stimulate increased interest in a subject area. Second, they promote increased identification with other times, values, and cultures. Simulations aid in the establishment of frames of reference for the students. Third, simulations convey information on a variety of military units, their capabilities, and historical

significance. Finally, simulations facilitate generalizations of learning transfer through the understanding of tactics, decision-making, and the impact of decision-making.⁵⁹

Senge describes the benefits of microworlds in his book *The Fifth Discipline*.⁶⁰ He states when we act in a complex system the consequences of our actions are neither immediate nor unambiguous. Often, they are far removed from us in time and space. This leads to the "dilemma of learning from experience." We learn best from experience, but we never experience the consequences of our most important decisions.⁶¹ He poses the question how, then, can we learn?

Senge offers that microworlds enable leaders and organizations to begin "learning through doing" about their most important systemic issues. Microworlds "compress time and space" so that it becomes possible to experiment and to learn when the consequences of our decisions are in the future and in distant parts of the organization. While the computer-based microworlds are new, the principle of learning through microworlds is actually familiar to us all.⁶²

Senge goes on to state organizational learning occurs in three ways: through teaching, through "changing the rules of the game" (such as through openness and localness), and through play. Play is the most rare, and potentially the most powerful. Microworlds are places for "relevant play."⁶³

These microworlds illuminate several issues. The first, future learning, is when an organization discovers internal contradictions in a strategy that is only

just being put into place. The second is seeing hidden strategic opportunities. This occurs when an organization experiments with its members' mental models, and discovers that the assumptions the organization holds can shape the outcome of decisions. The third is discovering untapped leverage. This is when leaders play out the roles of subordinates in order to see how deceptively easy it is to "look good without being good," to mismanage workload in such a way that quality erodes an potential leverage for improving customer service and profitability is lost.⁶⁴

Senge concludes his discussion of microworlds with two predictions. The first is the future microworld will be more sophisticated in fostering the multiple learning disciplines. He gives an example of a computer simulation that actively fosters reflection by looking at individual decisions and saying, "Do you realize the patterns of decisions you have made?" Second, future microworlds allow all members of organizations to play out their real-world roles and understand more deeply how those roles interact. This will help the organization hone their systems thinking and team learning skills simultaneously, while also analyzing how individual decisions interact to create important problems.⁶⁵

David White provides three advantages of using simulations to teach.⁶⁶ First, there is an increased interest level in the subject matter and increased levels of motivation among student participants. Data to support these claims are derived from gains measured in affective domain and from gains in cognitive learning. Second, the cognitive gains are generally in the area of conceptual rather than factual learning. Third, the retention and transfer of these also seems

to be increased through the use of simulation games, and there appears to be and increased ability among students to integrate the instructional material leading to a holistic understanding of a particular subject area.⁶⁷ Given Dr. White's findings, the benefits in using simulations to train Army leaders enhances the transfer of theory and doctrine into practical application.

Simulation appears to be effective with regard to the acquisition, retention, and transfer of concepts and principles. Tactics and techniques are reinforced by simulations and increase learning. Additionally, they appear to be effective as a means of integrating disparate learning experience. Training certain types of equipment or executing certain tactics are unrealistic due to resource constraints.

The military does use wargames and simulations as a collective training tool. Most military installations have simulation centers to train its units. The Army's combat training centers incorporate simulations into its exercises. These wargames cost a tremendous amount of money, use very complex, expensive computer systems, and require a figurative "cast of thousands" to operate. To reach sufficient levels of detail and reality to be militarily useful these wargames were specifically procured in the early 1980's.⁶⁸ These games are very sophisticated and are not easily deployable and require advanced scheduling, coordination, and funds. They also cannot be reprogrammed readily to simulate the plethora of conflicts reflected in the current world situation.

There are problems associated with using Army simulations. Some of these are scheduling conflicts of dedicated facilities, the limited number of personnel to operate the associated equipment, and the short supply of umpires

needed to monitor the play. When a target of opportunity training time presents itself these problems inhibit the use of the Army simulations. What type of wargaming can the Army use to supplement the current tools? One alternative is commercial manual wargames. These take time to learn the complex rules, are not mobile, and require extensive preparation to setup. The bottom line is they are not user friendly. Personal computers provide an alternative to manual board wargames. The advances in artificial intelligence allow current games to contain a variety of terrain types and a database full of choices for units, equipment and scenarios. Some even allow the player to customize the game to alter the scenario.⁶⁹

Computer wargames enable the commander to sit down with and operate it himself. The commander can experiment with options that he might be reluctant to try through his staff because the idea, or results, might prove embarrassing. This last point is important, as the sociology of senior command makes it difficult for a commander to appear ignorant of anything or capable of doing something stupid, especially in front of subordinates.⁷⁰

Because battles occurs infrequently most soldiers have only a vague idea of what combat will be like. They are much more likely to be familiar with, and prepared for, say, a blizzard. Wargames give the soldier a hint of what combat is like and this provides an edge that is often crucial. Wargames enable them to see combat situations in a broader context. Leaders are required to conduct terrain analysis, an order of battle analysis, and consider of many other factors relating to the complex nature of warfare.

The next chapter conducts an analysis of the recommendation to use commercial computer wargames. Advantages and disadvantages are presented and then the recommendation is evaluated based on a set of four criteria. The chapter ends with the benefits of computer wargames outweighing the disadvantages and that using them simply makes sense.

CHAPTER 4 ANALYSIS

Commercial computer wargames provide an advantage in training Army leaders. Computer wargames are meant to supplement the Army's training plan and not take the place of existing training. Like any training, computer wargames have disadvantages and pitfalls. This chapter reviews the advantages and disadvantages of computer wargames and then analyzes their use based on three criteria.

The evaluation criteria are cost effectiveness, time saving, and high payoff training. The goal is the ability of the Army to provide leaders with the multitude of experiences necessary to improve their leadership and decision-making abilities. Cost effective training means supplementing the existing training used by the Army without reducing their resources or training objectives. Competition for a finite amount of resources could prejudice the implementation of this training if it is perceived to inhibit the current training strategy. Time saved is important if wargames can reduce the operational tempo of deployments, reduce the time required for leader training, and increase learning in a shorter timeframe. Instead of waiting to go to the training, the training comes to the leader. The definition of high payoff training means achieving more than one learning objective or the accomplishment of more tasks with fewer resources. This ties the other evaluation criteria together when cost is reduced, time is saved, experience increases, and leaders learn more.

Commercial computer wargames provide a variety of advantages to the military. It is important to convince military leaders of the advantages of using what may seem like a toy for serious training.

James Dunnigan provides several advantages to the use of wargames.⁷¹ He suggests they have the ability to telescope of time requirement. This allows the player to focus on tactical actions and decision-making. Wargame situations allow the player on different terrain in all weather environments. This is unrealistic in today's resource constrained military. The trainer and user have precise control and management of the situation. The computer game can be halted or reprogrammed if mistakes are made, the player wants to retrain on a specific an event, or wants to simply try a different decision. The player is exposed to a wide range of problems that could never be covered in a field exercise. Commercial computer wargames cost less than other types of training. The price of the software is minimal and can be used to train a wide audience. Most if not all military organizations have the computer hardware to run the current wargames. A leader is able to train all branches in combined arms operations. This occurs infrequently and is resource intensive. Some leaders never train all the combat arms during their careers. Wargames also provide the ability to train on weapon systems at maximum ranges. Environmental restrictions, increased weapon lethality, and cost of ammunition limit the employment of some weapons systems during training. Dunnigan concludes computer wargames provide further insight and understanding to the study of warfare.⁷²

Thomas Hone offers the following insights on the advantages of wargames in his Spring 1998 *Joint Forces Quarterly* article on military education.⁷³ Wargames allow the professional to explore the consequences of alternate plans and actions without running the risks inherent in actual trial and error. The wargame enables the player to have quasi-controlled conditions on problems involving complicated systems cooperation, competition and conflict, and human decision. He also adds, wargames permit the military leader to try out policies, strategies, and courses of action which would be prohibitively costly, dangerous or even disastrous, and in some cases impossible to study adequately by other means. He states the greatest values in war gaming, or in the gaming technique when applied in other fields, is that it can provide an impelling stimulus to innovation, strong motivation, and a favorable climate for creativeness. Gaming therefore establishes an environment that challenges and motivates a responsible participant. The wargamer must bring all past judgement to bear on analyzing the situation confronting him and then employ the best possible approach in meeting that situation. Hone states the wargamer knows that he is matched against a competent and resourceful opponent, whose performance could make his own, look somewhat less than favorable in the profession in which he wants to excel.

Wargames challenge the competitive spirit and spurs the contenders to do their best in a given situation. It stimulates the search for new and more effective ways of meeting situations and encourages innovation. Motivations aroused in wargaming serve as incentives which, though less intense than those in real

warfare, may have carryover values that will pay off in the ultimate test of actual combat. Each opponent is impelled to seek out and recognize essential and critical elements of the situation and the limitations of resources. Each opponent is spurred to employ the best known past experience, originate, invent, and employ a still better or newer concept or innovation. Hone concludes wargaming is the seedbed for the germination of new ideas and a nursery in which to develop and nurture those ideas.⁷⁴

Wargaming is not confined to the United States. The British War College at Camberley uses wargames to support its teaching aims. The wargames assist in teaching and practicing the students in tactics. Staff officers are able to practice planning and execution of operations focusing on all aspects of staff work. The wargames give the students practice running and the interaction of an operational headquarters. They enable the examination of the problems of conducting joint and combined operations through the whole spectrum of campaign planning. Probably the most important is the practice of decision-making under realistic operational setting. Finally, wargames at Camberley assess students in their understanding and ability to practice what has been taught.⁷⁵

Combat units of the Army National Guard use simulations to make better use of time and to enhance overall performance. The goal of the National Guard is to improve performance by 200 percent and shorten the time units will be combat ready.⁷⁶ With a limited amount of time available per year to train, the

Guards use of computer wargames enables them to practice fighting battles every weekend.

In David Lee's article on Wargaming in the *Airpower Journal* he provides several more advantages to wargames. He offers they make people think about war. The players can test their skills in the art of making decisions that affect thousands of people, despite the lack of information. They can be used to investigate new ideas without risk of live of soldiers. Wargames are a less expensive alternative to a CPX and field exercise. Campaigns can run repeatedly without actually expending resources. Lee highlights a truth about combat by stating hours of boredom sprinkled with moments of terror are a reality of the battlefield, and critical decisions are often made during the moments of terror. Wargames enable time can to be compressed or expanded during wargames to focus on campaign issues and discuss available options. The hours of boredom are disposed of in a tick of the clock. Like the other authors, he states any location in the world can be the setting for the wargame and any situation can be played.⁷⁷

Robert Ackerman forecasts the advantages of future of wargames in the twenty-first century in his 1992 article in *Signal* magazine.⁷⁸ He indicates both training and research and development stand to gain from increased emphasis on simulation. He states this method of training will become all the more essential as platforms and components become more complex and as the Army increases its dependence on the National Guard and Reserves. Future areas of emphasis may include geo-specific simulations of combat environments. These

would simulate key characteristics of potential deployment sites. During battles, field commanders would be able to conduct real-time wargames based on simulation programs in the battlefield command network. This could allow commanders insights into future battles.

Ackerman goes on to state research and development efforts can profit from exercises that illuminate aspects of warfare such as low-intensity conflict, counter-insurgency, or peace operations. This would enable planners to design new hardware or doctrines to deal with potential crises. He correctly saw that prospective or theoretical Army weapons also could undergo evaluation before they roll off the assembly line. This use of wargames is currently being used to look at evolving doctrine and weapon systems with the Army After Next study.

Ackerman's article concludes this technological capability can translate into battlefield success if widely used by Army personnel. He recommends commanders at various levels war game for their appropriate degree of involvement in decision-making. Strategic planners could explore alternatives for policy implementation, while tactical commanders could consider response alternatives in real time. Two essential aspects to system success would be having the necessary up-to-date information in the data base and ensuring that personnel are familiar with its operation and use.⁷⁹

Like any training commercial computer wargames have disadvantages, limitations, and pitfalls. Arguments can be made for any new training method or system. The goal is to balance the disadvantages to the advantages and determine if the benefits outweigh the limitations.

Dunnigan provides several disadvantages to wargames. Correctly he notes they lack the participation of lower echelons of command and enlisted personnel. Wargames lack the friction associated with the battlefield. This includes personnel problems, medical evacuation requirements, moral, leadership, equipment and ammunition shortages, and maintenance problems. He warns that wargames augment but do not replace training.⁸⁰

David Lee's "Wargaming" article balanced the advantages with several limitations to wargames.⁸¹ Like Dunnigan he warns that wargames supplement but do not replace other training techniques. Wargames do not match reality. The model provided by a designer can never predict exactly what would occur in a real conflict. Human relations, mechanical failure cannot be satisfactorily quantified or simulated in a game. Lee states wargames do not convey the threat of death that is prevalent on the battlefield. Losing or inappropriate play does not call down severe penalties that accompany failure. Since physical threats are not real, players may not react the same way in the game as in real life. The player may be more complacent or may be too aggressive. When discussing large wargames developed by the military he warns they are not as inexpensive as they may appear. Additionally, they take time to develop, resource, and implement. This is not necessarily the case with commercial computer wargames. Lee goes on to say wargames are a shadow of war and should be taken as such. If wargames are taken too seriously they can lead to prediction which can be dangerous. When taken too lightly, only as a game, they cannot serve the purpose for which they were made, training for war.⁸²

Some of the pitfalls of wargames Lee describes in his article relate to the response of the player to the wargame. When a player loses a computer wargame he justifies losing by insisting that parts or all of the game are incorrect. The player will then declare the whole computer wargame invalid. Lee also warns the player not to prove points to arguments based on the outcome of a wargame. He offers the wargame is designed to raise issues not settle them. Finally, he states a wargame should not be used as a predictor.⁸³

Lee further highlights the fact that predicting the future is a risky business at best, and when models and simulations are used to do so, they should be tested against a range of similar past experiences. Any model that has been validated by replicating the outcomes of the historical events it is designed to predict will produce results in which the analyst can have greater confidence.

Charles Hawkins echoes the warnings of the other authors in his 1992 *Signal* article on predicting future warfare through simulations.⁸⁴ Hawkins emphasizes the overriding aspect of combat is that of fear in a lethal environment, the effects of which are not felt in field training exercise, staff rides, command post exercises and other military training events. He goes on to warn the effects of fear and lethality are difficult to represent in combat simulations and wargames.

The evaluation criteria mentioned earlier helps to further analyze the use of computer wargames. The more time saved in training is better. If the return in training benefits the individual and organization then it is better. If cost savings

occur this is better. When combined the criteria establish the use of computer wargames as a credible supplement to the Army's leader training.

Does training with computer wargames save time? Preparation is required for any type of training. Computer wargames have established scenarios, researched and fairly accurate data, and if designed correctly built in decision-making skills. The wargames are self contained tools ready for use. No preparation time other than deciding to use the wargame is necessary. Execution of the wargame takes as long as the game design requires. The duration of games can last from several minutes to several hours. The player determines the time spent playing the game. Wargames enhance leader training by focusing classroom training on the tasks necessary to prepare leaders for collective training. A wide variety of tasks can be covered in a short time during the game. Finally wargames can be used as opportunity training when there is the inevitable down time. Instead of doing nothing while waiting for transportation, the next training event, a meeting to complete the leader can fill the void by playing a computer wargame.

Can using computer wargames have a high payoff when training Army leaders? The one characteristic common to computer wargames is their ability to provide repetition in the execution of decision-making. The leader becomes better at decision-making just as the athlete becomes better at a sport through repetitive exercises. The Army leader is able to implement the theory, doctrine, and principles of tactics, operational art, and strategy. Study is transferred into execution. The only other way to transfer this information is through field

training. Earlier this monograph addressed the constraints leaders face in resources. When leaders learn and understand the how of the application of their profession they are able to transfer the knowledge quicker when the field training occurs. This early learning broadens understanding and cognitive ability that increases performance in field, better leaders, and better units. If you had to choose a training device that had economy of scale, then computer wargames rise to the top of the list.

Is it cost effective to use computer wargames? Computer-aided exercises are a form of war gaming supported by simulation to increase realism. The wargames provide a means to train in situations that are difficult or impossible to otherwise accomplish. These exercises reduce the cost of war gaming by not placing troops in the field.⁸⁵

All forms of training cost money. Depending on the complexity, whether a combat training center rotation or a professional development class conducted in garrison and length of the training cost does increase. Long-term capital investment required building and sustaining training capabilities. The cost of war cannot be measured. The cost of a human life cannot be established.⁸⁶ The new Warfighter simulation 2000 (WARSIM 2000) program costs about \$110 million. Advanced distributed simulation technology (ADST) program costs about \$200 million.⁸⁷

The average commercial computer wargame cost \$25 to \$50 dollars. These wargames require a personal computer with a 1995 or better operating system. Most military units have compatible computers. The comparison is

obvious. For the training the individual or small groups of leaders commercial wargames are definitely cost effective.

The advantages of using commercial computer wargames far outweigh the disadvantages. When analyzing the evaluation criteria computer wargames again seem like reasonable training tool for Army leaders to use. The question then arises how to convince the Army to incorporate commercial computer wargames as a regular part of the training. The next step is to convince the computer gaming industry to tailor the design of its games to fit the Army requirements. The next chapter provides recommendations how to incorporate wargames into training and what the commercial software industry can do for the Army.

CHAPTER 5 SUMMARY

One cannot become a chess master in a single game; one cannot uncover the intricacies of warfare in a single wargame. In the absence of real combat experience, war gaming should be used to season current and future leaders. Wargames can be used creatively to examine or discover issues in any military job or area. Results that show promise can be verified through field tests and exercise. Paying strict attention to the purpose of war-games and by critically examining the issues and concepts they provide, the military can use them.⁸⁸

This monograph began with the thesis that computer wargames can be useful in developing the decision-making abilities of Army leaders and add to their experience level with an available, low cost, and easy to use tool. The answer is yes. This monograph shows the computer wargame used consistently by Army leaders can increase experience and decision-making skills. Like any training, computer wargames must be used repetitively to achieve results. Commercial computer wargames are available now. The software industry produces a wide variety of wargames enabling leaders to focus on the level of war that suits rank and position. The costs of computer wargames are negligible. The Army could purchase site license from the software industry for wide distribution or units could locally purchase the games. The bottom line is, using commercial computer wargames to develop the decision-making abilities of Army leaders and increase their experience makes sense.

Some Recommendations for the Army.

The U.S. Army must include the use of computer wargames in Army training doctrine as a valid training method. The Training and Doctrine (TRADOC) Commander endorses the use of commercial computer wargames as a training method. Include a list of suggested computer wargames in Army professional publications similar to the professional reading list. In addition, encourage feedback and reviews of the wargames. Increase the use of computer wargames at the professional development schools. Army training espouses performance-oriented training, computer wargames can be a step in the process of this method. Additionally, the training should start early during cadet training at West Point, Reserve Officer Training Corps, and Officer Candidate School and continue through the senior service colleges. Educate all officers on the benefits of computer wargames. Purchase computer wargames for the Army. Establish an Internet site with links to computer wargames. Work with the computer gaming industry to focus design on detailed artificial intelligence, decision-making, and current capabilities. Keep the use of commercial wargames low cost. Use commercial software designers that develop games that have civilian applicability.

Recommendations for Industry.

Design wargames that cover all the levels of war, tactical, operational, strategic. Design wargames that cover the full spectrum of conflict, Peace through major theater warfare. Incorporate decision-making in all wargames.

Keep the wargame affordable and user friendly. Insure the wargame can be played solitaire or by multiple players.

Conclusions

General (Ret) Richard E Cavazos said "What I value most in war are officers of courage, tenacity, guile and cunning. Guile and cunning because we should bait and entrap the enemy to frustrate, confuse and frighten him. Guile and cunning are the natural products of young leaders of imagination." ⁸⁹

Jim Dunnigan states in his book *Wargames*, "It is not a matter of who's better, but who is worse." Victory goes to the side that has more advantages and playing out maneuvers and uncertainty of warfare in a crude wargame tends to give the wargamer the edge.⁹⁰

Computer wargames are a viable addition to the Army training method. Computer technology is available now to enhance the training of Army leaders. Commercial wargames are one way to accomplish the task of increasing decision-making and experience. Nothing substitutes like real experience. It is unrealistic to expect constant warfare to gain experience. It is realistic to expect constraints placed on resources in peacetime. Commercial computer wargames offer a cost effective, high payoff, and time saving training tool for Army leaders.

ENDOTES

¹ Lee, David. "Wargaming: Thinking for the Future." *Airpower Journal*, Summer 1990, 41.

² Barlett, David and Robert F. Curtis. "Why Not a Commandant's Wargame and Simulation List?" *Marine Corps Gazette*, July 1994, 28.

³ Lee, David. "Wargaming: Thinking for the Future." *Airpower Journal*, Summer 1990, 41.

⁴ Klein, Gary. *Making Decisions in Natural Environments*. U.S. Army Research Institute. February 1997, 1.

⁵ Dunnigan, James F. *The Complete Wargames Handbook*. New York, NY. William Morrow and Company, Inc. 1992, 19-22.

⁶ Ibid, 19-22.

⁷ These wargames focus at the brigade task force level and higher. They require significant resources to operate to include a major part of the Army's training budget, external civilian contractor support, extensive hardware, and a deliberate pre-training plan to execute on wargame.

⁸ JCS Pub 1. DOD Dictionary of Military and Associated Terms. Washington, D.C.: Government Printing Office, 1 June 1987, 393. Lee, David. "Wargaming: Thinking for the Future." *Airpower Journal*, Summer 1990, 40-51.

⁹ White, David, M.. "Use and Selection of Simulation Games for Instruction: An Analysis of Programs in Military History." PHD Dissertation. Department of Educational Administration. University of Utah. June 1983, 1.

¹⁰ Hone, Thomas, C. "Professionalizing; Command, Education, and Defense." *Joint Forces Quarterly*. Spring 1998, 91.

¹¹ Dunnigan, James F. *The Complete Wargames Handbook*. New York, NY. William Morrow and Company, Inc. 1992, 236.

¹² Barlett, David and Robert F. Curtis. "Why Not a Commandant's Wargame and Simulation List?" *Marine Corps Gazette*, July 1994, 28-30.

¹³ _____ "Simulation Realism Extends Battlefield Environment." *Signal* 1996, 31-34.

¹⁴ Ibid, 31-32.

¹⁵ Hone, Thomas, C. "Professionalizing; Command, Education, and Defense." *Joint Forces Quarterly*. Spring 1998. 91-98.

¹⁶ Deems, Paul, S. "War Gaming and Exercises," *Air University Quarterly Review* 9 no.1 Winter 1956-57, 99.

¹⁷ Hjalmarson, J.K., "The Development of Wargames." *Canadian Army Journal* 15 no.1 Winter 1961, 51.

¹⁸ Ibid, 51.

¹⁹ Stern, Theodore, E. "Wargames: What They Are and How They Evolved." *Army* 16 no.3 March 1966, 44.

²⁰ Wilson, Andrew. "The Bomb and the Computer." New York, NY. Delacorte Press, 1968, 3-5.

²¹ Ibid, 8-10.

²² Dunnigan, James F. *The Complete Wargames Handbook*. New York, NY. William Morrow and Company, Inc. 1992, 6.

²³ Hone, Thomas, C. "Professionalizing; Command, Education, and Defense." *Joint Forces Quarterly*. Spring 1998, 92. (Discussion of developing Naval Officers at the Naval War College in 1911) Later re-emphasized by Admiral William S. Sims, President of the Naval War College after World War I.

²⁴ Ibid, 238-239.

²⁵ Dunnigan, James F. *The Complete Wargames Handbook*. New York, NY. William Morrow and Company, Inc. 1992, 235.

²⁶ Perla, Peter, P. "Wargaming's Widening World." *Military History*. December 1994, 43.

²⁷ Lee, David. "Wargaming: Thinking for the Future." *Airpower Journal*, Summer 1990, 40-51.

²⁸ Dunnigan, James F. *The Complete Wargames Handbook*. New York, NY. William Morrow and Company, Inc. 1992, 234.

²⁹ _____ "Commercial War Game Sets Spell Doom for Adversaries." *Signal*. July 1996, 35-37.

³⁰ Ibid, 13.

³¹ Dunnigan, James F. *The Complete Wargames Handbook*. New York, NY. William Morrow and Company, Inc. 1992, 14.

³² Ibid, 87.

³³ Ibid, 87-88.

³⁴ Ibid, 223.

³⁵ Ibid, 224.

³⁶ Ibid, 233.

³⁷ MicroSoft, Close Combat Game Series I-IV and Strategic Simulation Inc Steel Panthers I-IV Series.

³⁸ Thompson, Della. *Oxford Dictionary of Current English*. Oxford University Press. Oxford New York. 1998, 220.

³⁹ Ibid, 49.

⁴⁰ Adair, John. *Training for Decisions..* MacDonald and Company, London, England. 1971, 62-63.

⁴¹ Ibid, 84.

⁴² Ibid, 87.

⁴³ Ibid, 15.

⁴⁴ Ibid, 16-18.

⁴⁵ Ibid, 23.

⁴⁶ Ibid, 84-85.

⁴⁷ Klein, Gary. "Making Decisions in Natural Environments" Gary Klein. U.S. Army Research Institute. February 1997, 2-4.

⁴⁸ Ibid, 7.

⁴⁹ Ibid, 9.

⁵⁰ Ibid, 4-11.

⁵¹ Ibid, 17.

⁵² Ibid, 19.

⁵³ Gonsalves, James, D. USMC. "The Tactical Decision Game (TDG). *Armor* May-June 1997, 36.

⁵⁴ Ibid, 36.

⁵⁵ Ibid, 37.

⁵⁶ Ibid, 38.

⁵⁷ Geryk, Bruce. "Detail vs Realism: What this means for PC wargames." *Games Domain Review* (online gamesdomain.ru/gdreview/depart/jun98/realdet.html) downloaded 20 July 1998.

⁵⁸ Geryk, Bruce. "Detail vs Realism: What this means for PC wargames." *Games Domain Review* (online gamesdomain.ru/gdreview/depart/jun98/realdet.html) downloaded 20 July 1998.

⁵⁹ White, David, M.. "Use and Selection of Simulation Games for Instruction: An Analysis of Programs in Military History." PHD Dissertation. Department of Educational Administration. University of Utah. June 1983, 45.

⁶⁰ Senge, Peter M. *The Fifth Discipline*. Currency Doubleday. New York, NY, 313.

⁶¹ Ibid, 313.

⁶² Ibid, 313-314.

⁶³ Ibid, 315.

⁶⁴ Ibid, 316.

⁶⁵ Ibid, 337.

⁶⁶ Ibid, 108.

⁶⁷ Ibid, 108.

⁶⁸ JANUS is the current simulation used by the military to train units at the division and below. The next generation wargame is WARSIM. Each requires extensive funding, contractors to program and operate, fixed sites to operate

from, and are limited in number. Though realistic and extremely beneficial to training unit participation is limited to one or two times per year.

⁶⁹ Barlett, David and Robert F. Curtis. "Why Not a Commandant's Wargame and Simulation List?" *Marine Corps Gazette*, July 1994, 28-30.

⁷⁰ Dunnigan, James F. *The Complete Wargames Handbook*. New York, NY. William Morrow and Company, Inc. 1992, 240-241.

⁷¹ Ibid, 19-22.

⁷³ Hone, Thomas, C. "Professionalizing; Command, Education, and Defense." *Joint Forces Quarterly*. Spring 1998, 92-98.

⁷⁴ Ibid, 92-98.

⁷⁵ Obe, C.S. Grant, "Wargames at Camberley." *RUSI Journal*, October 1993. 38-43.

⁷⁶ Grady, John E. "Simitar: Guardsmen Get an Edge." *Army*. February 1994. 44-45.

⁷⁷ Lee David. "Wargaming: Thinking for the Future." *Airpower Journal*. Summer 1990, 40-51.

⁷⁸ Ackerman, Robert, K. "Twenty-First Century Army to Embrace High Technology." *Signal*. July 1992, 49-51.

⁷⁹ Ibid, 49-51.

⁸⁰ Dunnigan, James F. *The Complete Wargames Handbook*. New York, NY. William Morrow and Company, Inc., 19-22.

⁸¹ Lee, David. "Wargaming: Thinking for the Future." *Airpower Journal*, Summer 1990, 40-51.

⁸² Ibid, 40-51.

⁸³ Ibid, 40-51.

⁸⁴ Hawkins, Charles, F. "Armored Combat Simulation Predicts War's Consequence." *Signal*. July 1992, 29-30.

⁸⁵ _____. "Computer Simulation Realism Conquers Real - World Barriers." *Signal*. July 1992, 4.

⁸⁶ Hone, Thomas, C. "Professionalizing; Command, Education, and Defense." *Joint Forces Quarterly*. Spring 1998, 91-96.

⁸⁷ _____. "Demanding, Realistic Training Spans Spectrum of Operations." *Signal*. July 1996, 40.

⁸⁸ Lee, David. "Wargaming: Thinking for the Future." *Airpower Journal*, Summer 1990, 40-51.

⁸⁹ Dunnigan, James F. *The Complete Wargames Handbook*. New York, NY. William Morrow and Company, Inc., 82.

⁹⁰ *Ibid*, 83.

BIBLIOGRAPHY

Books

- Adair, John. *Training for Decision*. London, England. MacDonald and Company. 1992.
- Antal, John, F. *Armor Attacks*. Novato, CA. Presidio Press. 1991.
- Beniger, James, R. *The Control Revolution*. Cambridge, MA. Harvard University Press. 1986.
- Brewer, Gary, D. and Martin Shubik. *The Wargame, A Critique of Military Problem Solving*. Cambridge, MA. Harvard University Press. 1979.
- Cohen, Eliot, A. *Military Misfortunes, The Anatomy of Failure in War*. New York, NY. The Free Press. 1990.
- Dorner, Dietrich. *The Logic of Failure*. New York, NY. Metropolitan Books. 1989.
- Dunnigan, James, F. *The Complete War Games Handbook*. New York, NY. William Morrow and Company. 1992.
- Dupuy, T.N. *Numbers, Predictions, and War*. Fairfax, VA. Hero Books. 1985.
- Freeman, Jon. *The Complete Book of War Games*. New York, NY. Simon and Schuster. 1980.
- Grant, Charles. *The War Game*. New York, NY. St Martin's Press. 1971.
- Hausrath, Alfred, H. *Venture Simulation in War, Business, and Politics*. New York, NY. McGraw-Hill Book Company, 1971.
- Janis, Irving, L. and Leon Mann. *Decision Making*. New York, NY. The Free Press. 1977.
- Johnson, Spencer. *"Yes" or "No."* New York, NY. Harper Collins Publishers. 1992.
- Kelly, Kevin. *Out of Control*. Reading, MA. Addison-Wesley Publishing Company. March 1995.

- Klien, Gary. *Making Decisions in Natural Environments*. Research and Advanced Concept Office, U.S. Army Research Institute for Behavioral And Social Science. February 1997.
- Klien, Gary. *Sources of Power, How People Make Decisions*. Cambridge, MA, MIT Press, 1999.
- Marvin, Phillip. *Developing Decisions for Action*. Homewood, Illionios, Dow Jones-Irwin Inc, 1971.
- Meisner, Arnold and Will Fowler. *War Games! Rehearsal for Battle*. London, England. Sterling Publishing Co. 1988.
- Neyland, David, L. *Virtual Combat*. Mechanicsburg, PA. Stackpole Books. 1997.
- Piattelli-Palmarini, Massimo. *Inevitable Illusions*. New York, NY. John Wiley & Sons, Inc. 1994.
- Plous, Scott. *The Psychology of Judgement and Decision Making*. Philadelphia, PA. Temple University Press. 1993.
- Prados, John. *Pentagon Games*. New York, NY. Harper and Row Publishers. 1987.
- Russo, Edward, J. and Paul J.H. Schoemaker. *Decision Traps*. New York, NY, Simon and Schuster, Inc., 1989.
- Senge, Peter, M. *The Fifth Discipline*. New York, NY. Currency Doubleday Books. 1990.
- Toms, Ralph, M. and Lauri A. Dobbs, and Jeffery E. Pimper. *High Resolution Combat Simulations To Support Training for Close Combat Light Applications*. 14 June 1990. Albuquerque, NM. 1990.
- Waldrop, Mitchell, M. *Complexity*. New York, NY. Touchstone Books. 1992.
- White, David, M.. "Use and Selection of Simulation Games for Instruction: An Analysis of Programs in Military History." Ph.D. Dissertation. Department of Educational Administration. University of Utah. June 1983.

Journals and Periodicals

- Bay, Austin. "Controlled, Flexible Military Revolution." Army. June 1993. 22-28.
- Bartlett, David, A. and Robert F. Curtis. "Why Not a Commandant's War Game and Simulations List." Marine Corps Gazette. July 1994, Vol. 78, No. 7. 28-30.
- "Commercial War Games Sets Spell Doom for Adversaries." Signal. July 1996. 35-37.
- Duezabou, John, M. "Small Unit Terrain Board Exercise." Armor. January-February 1993. 45-49.
- Grant, C.S. "Wargames at Camberley." The RUSI Journal. October 1993, Vol. 138, No. 5. 38-43.
- Gonsalves, James, D. "The Tactical Decision Game." Armor. May-June 1997, Vol. CVI, No. 3. 35-37.
- Haffa, Robert, P. and James H. Patton Jr. "Gaming the "System of Systems". Parameters. Spring 1998, Vol. XXVIII, No. 1. 110-121.
- Hawkins, Charles. "Armored Combat Simulations Predicts War's Consequence." Signal. July 1992. 29-30.
- Perla, Peter, P. "Future Direction of Wargames." Joint Forces Quarterly. Summer 1994, No. 5. 77-83.
- Killebrew, Robert, B. "Learning from Wargames, A Status Report." Parameters. Spring 1998, Vol. XXVIII No. 1. 122-135.
- Mastaglio, Thomas, W. and Thomas R. Rozman. "Expanding Training Horizons." Army. February 1994 Vol. 44, No.2. 38-42.
- Seidenman, Paul. "High Fidelity Mock Combat." Army. August 1992. 38-42.
- Vesely, David. "Training Battle Commanders." Defense 91. July/August 1991. 13-16.
- Walter, Daniel, L. "Simulation or Just A Game?" Marine Corps Gazette. August 1997, Vol 81, No 8. 21-23.
- West, F.J. "The Traders Game." Marine Corps Gazette. June 1997, Vol 81, No. 6. 24-26.